found existing on reaching their future home, Dr. Macgowan remarked that the philosopher of Universal Love, Motzu, proto-altruist and arch-heresiarch—whose sun was rising when the sun of Confucius was setting—enunciated views on the evolution of the state and family which are in accord with those of modern anthropologists. Men at first were in the lowest state of savagery: there was no Golden Age as depicted by sages and political philosophers until men felt the necessity of a remedy for the anarchy that prevailed. Practices of self-deformation were some of them remarkably curious, such as those of drinking through the nostrils, extracting front teeth and substituting dogs' teeth, head-flattening, &c.; the most striking was the attempt to raise a polydactylous race, by destroying all children who came into the world with the usual number of fingers and toes, and thus a tribe had a dozen fingers and as many toes. The writer then described a number of instances of rule by Amazons, and observed that it is chiefly among the aboriginal inhabitants that the chieftaincy of women obtains to this day. There is seldom an age in which one tribe or another does not afford examples; the more primitive the condition of these tribes the slighter is sexual differentiation as regards public governmental affairs, both civil and military. It was owing to rumours respecting tribes of this kind that fables and myths in Greece arose regarding Indo-Scythian Amazons. The paper, which is full of valuable ethnological matter, will be published in the Journal of the Society.

A PAPER upon the spontaneously inflammable liquid hydride of phosphorus, P_2H_4, is communicated by Drs. Gattermann and Haussknecht, of Heidelberg, to the new number of the *Berichte* (p. 1174). Owing to the disagreeable and highly dangerous properties of this substance, its chemical history has never been completed; very little, indeed, has been hitherto added to our knowledge concerning it since its discovery by Thénard in 1845. The Heidelberg chemists have devised a much better mode of preparing the liquid from phosphide of calcium, by means of which it is obtained in a state of almost perfect purity. A Woulfe's bottle with three necks and of about two litres capacity is three parts filled with water. The central tubulus serves to introduce a wide tube of 15 mm. diameter expanded into a funnel at the top and passing down to about three centimetres beneath the water. One of the side necks is fitted with a cork and a bent tube just dipping beneath the surface of the water, through which a current of hydrogen gas can be driven. The third tubulus carries the delivery tube which permits of the escape of first the hydrogen, and afterwards the products of the reaction between the calcium phosphide and the water, into a special form of condensing arrangement. The Woulfe's bottle is placed in a capacious water-bath, which is heated to 60° C. as soon as all the air is expelled by the current of hydrogen. The calcium phosphide is then introduced through the central wide tube in pieces about two grams in weight, until, in about 15–20 minutes' time upwards of 50 grams have been added. The escaping gases pass first through an empty wide test-tube in which most of the admixed water-vapour is condensed, then into an upright tube, narrowed in its lower half, and closed at the bottom, which forms a suitable receptacle for the liquid hydride. By means of an exit-tube the remaining gases are permitted to escape; owing to a little admixed and uncondensed vapour of the liquid, they burn spontaneously at the mouth of the tube. The condenser is surrounded with iced water instead of a freezing mixture, so that the condensation may be observed. In about five minutes after commencing the operation clear colourless highly refractive drops of the liquid form and run down into the narrower portion of the condenser, about 2 c.c. being obtained from 50 grams calcium phosphide. The experiment must not be performed in sunlight, otherwise the liquid rapidly decomposes, in the manner described by Thénard, into gaseous PH_3 and solid P_4H_2. By a slight addition to the above arrangement, all three hydrides of phosphorus may be simultaneously prepared. The escaping gases are allowed to pass through a large flask containing hydrochloric acid, which decomposes the vapour of the remaining liquid hydride, and large quantities of the yellow solid P_4H_2 separate out. The escaping gas, which may be collected over water, is non-spontaneously inflammable, and consists of practically pure PH_3. Liquid P_2H_4 boils constantly and without decomposition when not-suddenly heated at 58° under a pressure of 753 mm. Its specific gravity at 12° is 1·007, nearly the same as that of water. Exposed to sunlight it becomes yellow in half an hour, due to the formation of solid P_4H_2, which remains at first dissolved; after 2–3 hours' exposure, the yellow solid begins to separate out, and in 1½ days 0·2 gram is totally decomposed, in accordance with the equation $5P_2H_4 = 6PH_3 + P_4H_2$. Consequently, sealed tubes containing this substance exposed in daylight are very dangerous articles. Owing to the accumulation of PH_3 gas, they are apt to explode with deafening concussion and production of a wide-spreading and very brilliant flame, especially if the drawn-out end becomes accidentally broken off.

THE additions to the Zoological Society's Gardens during the past week include a Wanderoo Monkey (*Macacus silenus* ♀) from the Malabar Coast of India, presented by Miss Eileen Martin; two Leopards (*Felis pardus*) from India, presented by Mr. — Egerton; two Yellow-winged Blue Creepers (*Cœreba cyanea*) from South America, presented by Mr. H. E. Blandford; two Mandarin Ducks (*Æx galericulata* ♂ ♀) from China, presented by Mr. C. J. Kingzett; two —— Touracous (*Corythaix* sp. inc.) from South Africa, presented by Mr. C. W. Burnett; two Undulated Grass Parrakeets (*Melopsittacus undulatus*) from Australia, presented by Mr. A. Golden; two Common Vipers (*Vipera berus*), British, presented respectively by Mr. W. H. B. Pain and Mrs. Mowett; an Australia Peewit (*Lobivanellus lobatus*) from Australia, presented by Capt. Shepherd; a Himalayan Bear (*Ursus tibetanus* ♂), two Bengal Foxes (*Canis bengalensis*), two —— Hares (*Lepus macrotis*) from India, a Ruffed Lemur (*Lemur varius*) from Madagascar, deposited; two Bar-tailed Pheasants (*Phasianus reevesi* ♀ ♀), an Amherst Pheasant (*Thaumalea amherstiæ* ♂) from China, a Variegated Sheldrake (*Tadorna variegata* ♀) from New Zealand, two Black-headed Conures (*Conurus nanday*) from Paraguay, purchased; a Crested Porcupine (*Hystrix cristata*), born in the Gardens.

OUR ASTRONOMICAL COLUMN.

OBJECTS FOR THE SPECTROSCOPE.

Sidereal Time at Greenwich at 10 p.m. on May 22 = 14h. 1m. 54s.

Name.	Mag.	Colour.	R.A. 1890.	Decl. 1890.
			h. m. s.	° ′
(1) G.C. 3770	—	White.	13 59 17	+52 54
(2) 69 Virginis	5·5	Yellowish-white.	13 21 35	−15 24
(3) B.A.C. 4699	5	Yellowish-red.	14 3 32	+44 23
(4) 20 Boötis	5	Yellow.	14 14 36	+16 49
(5) η Boötis	3	Yellowish-white.	13 49 30	+18 57
(6) U Cygni	Var.	Very red.	20 16 11	+47 33

Remarks.

(1) This very large nebula (101 M Boötis) has not yet been spectroscopically examined. According to the Parsonstown observations, it is at least 14′ across, and exhibits a spiral structure with arms and knots. It is everywhere faint, except in the middle. In the General Catalogue it is described as: "Pretty bright; irregularly round; at first gradually, then very suddenly much brighter in the middle to a small bright nucleus." The

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spectrum of such a diffused mass is likely to possess great interest, and the nebula is so large that it will probably not be difficult to differentiate the spectra of different regions.

(2) In his catalogue of stellar spectra, published in 1887, Konkoly records an observation of this star, in which bright lines were strongly suspected. Notwithstanding the recent additions to this group by Prof. Pickering and Mr. Espin, the number is still very small, and it is important that suspected cases should be fully investigated. The lines suspected by Konkoly in 69 Virginis were C, D_3, and F—the three commonly observed in β Lyræ and γ Cassiopeiæ. It is quite possible that the appearance of the lines is periodic, and observations should therefore be continued for some time. If the lines are of any considerable brightness, the observations ought not to be difficult, as the bright lines in the 8th magnitude stars in Cygnus are easily seen and measured with 10 inches aperture. Any irregularities in the continuous spectrum, especially in the green and blue, should be noted; and, if possible, comparisons should be made with the carbon flutings. Prof. Lockyer has pointed out that a line near λ 447 is associated with D_3 in the Orion nebula, and also in the solar chromosphere, and it is important to observe whether this also applies to the bright-line stars. He has demonstrated by photographs that the line in the nebula (447) is coincident with one of the bright lines photographed by Prof. Pickering in P Cygni.

(3) Dunér describes the spectrum of this star as a magnificent one of Group II., particularly in the red end. The bands 1–9 are all strongly marked. The star is thus probably a little more advanced in condensation than the mean species of the group, and it will be interesting to know what line-absorptions appear at this stage, and also what is the extent of carbon radiation.

(4 and 5) These are given in Vogel's catalogue as stars of the solar type and of Group IV. respectively. The usual observations are required in each case.

(6) This is one of the very few variables with spectra of Group VI. So far, we have no records of any changes in spectra which may accompany the variations in magnitude, and the cause of the variability is, consequently, very imperfectly understood. Dunér says that the spectrum consists of three zones rather feebly developed, band 6 (near λ 564) being weak, but he does not state the magnitude of the star at the time of his observation. The next maximum will occur about May 28. The star ranges from about magnitude 7·5 to $<$ 11 in a period of 461 days. Changes of colour should also be noted.

A. FOWLER.

SPICA.—At the Berlin Academy of Sciences on April 24, Prof. Vogel announced that Spica consists of two close stars revolving round their common centre of gravity. The star's spectrum is that of Class IV., and twice in April 1889 the F line appeared to be shifted towards the violet end of the spectrum as compared with the Hβ line given by a vacuum tube, whilst once in the following month the shift appeared to be towards the red end. These observations and others made this year of the star's motion in line of sight are given in the following table, approach to the sun being indicated by (–) and recession from the sun by (+), both being expressed in German miles per second :—

Potsdam Mean Time.	h. m.	Observed Motion.	Relative to the Sun.	$*-\odot$
1889 April 21 ...	9 15 ...	– 11·6 ...	– 0·7 ...	– 12·3
,, 29 ...	11 10 ...	– 12 ...	– 1·2 ...	– 13·2
May 1 ...	10 58 ...	+ 7·5 ...	– 1·3 ...	+ 6·2
1890 April 4 ...	11 30 ...	– 3·4 ...	+ 0·5 ...	– 2·9
,, 9 ...	10 30 ...	– 14·2 ...	+ 0·2 ...	– 14·0
,, 10 ...	11 30 ...	– 0·3 ...	+ 0·1 ...	– 0·2
,, 11 ...	10 50 ...	+ 7·6 ...	0·0 ...	+ 7·6
,, 13 ...	10 50 ...	– 14·7 ...	– 0·1 ...	– 14·8
,, 15 ...	10 0 ...	+ 11·3 ...	– 0·3 ...	+ 11·0

The observations have been reduced to the epoch 1890, April 2, 10h. Potsdam mean time, and the period of revolution of the system determined as 4 days 0·3 hours. The greatest motion in line of sight due to the orbital velocity is about 12 miles a second, and the system as a whole is moving towards the earth with a velocity of about 3 miles a second.

From this it is found that the distance between the components of the system is 660,000 miles, and their total mass = 1·2 that of the sun.

It will be remembered that Algol is a spectroscopic double of the same character as the above described.

THE METEORIC THEORY OF COMETS.—In the *Sidereal Messenger* for May, Mr. W. H. S. Monck discusses the evidence that has been brought forward in support of this theory, and in connection with the meteoritic origin of the universe. Only four comets are definitely known to be connected with meteor-showers; and conversely, only four meteor-showers have been connected with comets; these comets are all periodic, the longest period being 415 years. From this fact it is argued that there is not sufficient evidence to allow the assertion that all comets are connected with meteor-swarms and that the ejection theory advocated by the late Mr. Proctor is supported. It is asserted that, since an ejection from a rapidly cooling body may be partly solid, partly liquid, and partly gaseous, the gaseous matter might form the comet and the solid (or solidified) matter form the attendant meteors; but for this origin to be true the assumption must be made that two planets exist beyond Neptune. Mr. Monck argues that because Arcturus was seen through 90,000 miles of Donati's comet, whereas Saturn's rings (except perhaps the inner crape ring) are not transparent, the rings must be more than 1000 times as dense as the comet at the point where it crossed between us and Arcturus, hence meteoritic collisions should be more frequent and the effect of the increased temperature should be made clearly manifest in the spectrum. The meteoritic hypothesis is not, however, objected to as a working hypothesis, but is said to be on an equality with the older nebular hypothesis; and the writer does not think the spectroscope will ever afford a crucial test between the two, for the reason that it cannot distinguish between a large solid, surrounded by a gaseous envelope, and a number of small bodies with interspaces filled with gas.

MASS OF SHOOTING-STARS.—Mr. C. C. Hutchins, in the *American Journal of Science* for May, gives the result of an investigation undertaken with the object of finding data for determining the mass of shooting-stars. Having determined the radiant energy of the standard candle, it was found that on the supposition that the rays of a meteor have the same ratio of visible to total energy as those of the candle, the mass of a meteor at a distance of 50 miles, having a magnitude equal to Vega and a velocity of 25 miles per second, would be 0·2936 gram if it continued two seconds. If the meteor in burning produce, for a given expenditure of energy more light than the candle, then a less mass would serve to produce the light given by it. A lump of the Emmett Co. (Iowa) iron meteorite was placed upon the lower carbon of an arc lamp and vaporized by the passage of the current, and it was found that for a given expenditure of energy the arc of meteoritic vapour gave ten times the light of the candle, hence the mass of a meteor giving the light of a first magnitude star moving with parabolic velocity, and lasting for two seconds, is 0·029 gram.

PHOTOGRAPHS OF THE MOON.—Admiral Mouchez, at the meeting of the Paris Academy of Sciences of May 12, presented a note on some new photographs of the moon obtained by the Brothers Henry at Paris Observatory. The instrument used was the equatorial 0·32 metres aperture, destined for the map of the heavens. The photographs are said to be far superior to those obtained in England and the United States with larger apertures, the superiority of the results being ascribed not only to the perfection of MM. Henry's objectives, but also to the method of direct enlargement adopted.

THE ROYAL SOCIETY CONVERSAZIONE.

THE *conversazione* held by the Royal Society on May 14 was in every way most successful. The attendance was large, and everyone was pleased and interested by the programme. We note some of the objects exhibited :—

The Director-General of the Geological Survey exhibited :—(1) A series of specimens illustrating deep borings in the south of England. In this case was arranged a series of cores and specimens from all the deep bores which during the last thirty years have been made in the south of England in search of water. They included the borings at Richmond, Crossness, Kentish Town, Meux's Brewery, Streatham, Turnford, Ware, Chatham, Gayton and Orton in Northamptonshire, Harwich, and Swindon. The positions of these bores were shown on the large index

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